PRELIMINARY
DRAINAGE STUDY
FOR
SANTANA TERRACE
CITY OF SANTA CLARA, CALIFORNIA

Job Number 17271-B

June 22, 2015

RICK ENGINEERING COMPANY

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CITY OF SANTA CLARA, CALIFORNIA

Job Number 17271-B

Kelly L. Birkes, PE
R.C.E #44644

Prepared For:

USA Properties Fund, Inc.
3200 Douglas Boulevard, Suite 200
Roseville, California 95661

Prepared By:

2525 East Bidwell Street
Folsom, California 95630
(916) 638-8200
www.rickengineering.com

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1.0 INTRODUCTION

This preliminary drainage report provides the findings, calculations, and results for the proposed Santana Terrace project. The project is located at 100 North Winchester Boulevard, in the City of Santa Clara, California. Please refer to Figure 1: Vicinity Map on the following page. This report has been prepared in conjunction with a stormwater management plan, titled "Preliminary Stormwater Management Plan for Santana Terrace," dated June 22, 2015, which includes more details regarding the permanent storm water control measures that will be incorporated into the project in order to mitigate the impacts of pollutants in storm water runoff from the proposed project.

The development consists of two senior apartment buildings consisting of 92 units with approximately 140,000 square feet of gross floor area, a pool and maintenance building, parking, walkways, landscaped areas, as well as a pool and spa, on approximately 1.86 acres. In the pre-project condition the site consists of one three story commercial office building reported to contain approximately 65,000 square feet of floor area, extensive paving areas, and landscaped areas. The existing site employs no permanent stormwater control measures. The existing project site is approximately 89.2 percent impervious and the proposed project results in a slight reduction of impervious area at 89.0 percent impervious.

1.1 Drainage Characteristics

In the pre-project condition, the lot is fully developed with an office building, parking, and landscaped areas. Drainage is conveyed through an on-site storm drain system to the southeast corner of the property and into an existing storm drain system within North Winchester Boulevard. The existing storm drain system flows south to north and ultimately discharges to San Tomas Aquino Creek.

In general the post-project drainage condition will remain similar to the pre-project condition drainage characteristics. Runoff from the site will be routed through a network of proposed biotreatment basins and a proposed storm drain system to the existing connection to the storm drain system in North Winchester Boulevard.

1.2 FEMA Flood Hazard Zone Information

The Santana Terrace project is shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) number 06085C0229H dated May 18, 2009. The project site is located within FEMA Zone X (shaded) and may be subject to flooding in the 500-year storm event. FEMA regulates flooding up to and including the 100-year storm event, therefore it is not anticipated that any FEMA submissions will be required for this project. A FEMA FIRMette for the project site has been included in Appendix 1.

Figure 1: Vicinity Map

2.0 HYDROLOGY

2.1 Off-Site Hydrology

Small portions of some of the adjacent residential and commercial properties drain towards the Santana Terrace project site. The preliminary project topography does not include the adjacent properties so quantifying these flows is not possible at this time. Prior to final design more detailed analysis of the adjacent properties will be conducted to quantify the flows entering the Santana Terrace property. A drainage system is planned at the back side of the proposed wall along the Santana Terrace project boundary to collect these flows and convey them offsite. No treatment is proposed for these flows as a part of the Santana Terrace project.

2.2 On-Site Hydrology

Hydrologic calculations were computed in accordance with the Santa Clara County, California - Drainage Manual, dated 2007 (SCCDM), and the City of Santa Clara – Design Criteria, Section 6, dated September 2014.

Peak flows were calculated using the Rational Method:

$$Q = C * i * A$$

Q = Peak runoff in cubic feet per second.
C = Weighted runoff coefficient.
i = Rainfall intensity in inches per hour.
A = Watershed area in acres.

Area

Watersheds were delineated to distinguish areas with similar flow characteristics as well as to determine peak flows at confluence points, existing and proposed storm water facilities, and to facilitate hydraulic analyses.

Time of Concentration

The time of concentration (Tc) used to calculate the intensity for this preliminary drainage study assumes an initial Tc value of 10 minutes where a substantial area is drained, and 5 minutes when only street or parking lot sections are drained. Due to the small size of the project site, an initial 5 minute Tc was utilized for all drainage basins. Beyond the initial Tc, additional Tc was calculated for the flow travel time through the on-site storm drainage system to determine the peak flow rate leaving the site. This travel time was estimated using Manning's equation assuming the pipe is flowing half full to determine the flow velocity and then taking the pipe flow distance divided by the velocity.

Intensity

The rainfall intensity was determined using equations (3-3) and (3-4) of the SCCDM and the Mean Annual Precipitation read from Figure A-2 of the SCCDM. An annotated copy of Figure A-2 has been included in Appendix 2.

Runoff Coefficient

The weighted runoff coefficients used for each minor basin was calculated by weighting the runoff coefficients for each type of land use within the basin by the percentage of the total area each land use represents.

2.3 Results

The discharges for the 10 and 100-year storm events have been calculated for the full existing project site, each proposed drainage basin, and the full proposed project site. The calculations can be found in Appendix 2. Hydrologic workmaps for the existing and proposed project site have been prepared and can be found in Appendices 3 and 4 respectively. Also, workmaps showing the land uses of the existing and proposed condition site are provided in Appendix 2. See Table 1 on the following page for a summary of the peak flow rates calculated for each drainage basin.

Table 1: Hydrologic Results

Pre- or Post-Project	Major Basin	Sub-Basin(s)	Total Area (ac)	Weighted Runoff Coefficient	Total Tc (min)	Intensity (in/hr)		Peak Flow Rate (cfs)	
						i_{10}	i_{100}	10-Year	100-Year
Pre-Project	Site		1.86	0.82	6.6	2.35	2.59	3.59	3.95
Post-Project	1	A	0.05	0.90	5.0	2.79	3.24	0.13	0.15
		B	0.06	0.90	5.0	2.79	3.24	0.15	0.18
		C	0.07	0.79	5.0	2.79	3.24	0.16	0.19
		D	0.06	0.83	5.0	2.79	3.24	0.13	0.16
		E	0.06	0.84	5.0	2.79	3.24	0.15	0.17
		F	0.05	0.84	5.0	2.79	3.24	0.13	0.15
		G	0.04	0.74	5.0	2.79	3.24	0.09	0.10
	2	A	0.08	0.90	5.0	2.79	3.24	0.20	0.23
		B	0.03	0.80	5.0	2.79	3.24	0.06	0.07
		C	0.05	0.84	5.0	2.79	3.24	0.13	0.15
		D	0.07	0.84	5.0	2.79	3.24	0.15	0.18
		E	0.06	0.83	5.0	2.79	3.24	0.13	0.15
		F	0.09	0.79	5.0	2.79	3.24	0.20	0.23
	3	A	0.04	0.65	5.0	2.79	3.24	0.06	0.08
	4	A	0.04	0.70	5.0	2.79	3.24	0.07	0.09
	5	A	0.06	0.90	5.0	2.79	3.24	0.15	0.17
		B	0.03	0.90	5.0	2.79	3.24	0.07	0.08
		C	0.02	0.90	5.0	2.79	3.24	0.06	0.07
		D	0.02	0.90	5.0	2.79	3.24	0.06	0.07
		E	0.01	0.90	5.0	2.79	3.24	0.04	0.04
		F	0.01	0.90	5.0	2.79	3.24	0.03	0.04
		G	0.06	0.44	5.0	2.79	3.24	0.07	0.08
	5		0.22	0.77	5.0	2.79	3.24	0.48	0.55
	6	A	0.05	0.90	5.0	2.79	3.24	0.13	0.16
		B	0.03	0.90	5.0	2.79	3.24	0.09	0.10
		C	0.03	0.90	5.0	2.79	3.24	0.07	0.09
		D	0.05	0.90	5.0	2.79	3.24	0.13	0.16
		E	0.03	0.90	5.0	2.79	3.24	0.09	0.10
		F	0.03	0.90	5.0	2.79	3.24	0.06	0.07
		G	0.03	0.90	5.0	2.79	3.24	0.07	0.08
	6		0.26	0.90	5.0	2.79	3.24	0.65	0.76

Table 1: Hydrologic Results (continued)

Pre- or Post-Project	Major Basin	Sub-Basin(s)	Total Area (ac)	Weighted Runoff Coefficient	Total Tc (min)	Intensity (in/hr)		Peak Flow Rate (cfs)	
						i_{10}	i_{100}	10-Year	100-Year
Post-Project	7	A	0.05	0.90	5.0	2.79	3.24	0.13	0.15
		B	0.05	0.90	5.0	2.79	3.24	0.13	0.15
		C	0.07	0.90	5.0	2.79	3.24	0.17	0.19
		D	0.05	0.83	5.0	2.79	3.24	0.11	0.13
		E	0.06	0.67	5.0	2.79	3.24	0.11	0.13
	7		0.28	0.84	5.0	2.79	3.24	0.65	0.76
	8	A	0.09	0.90	5.0	2.79	3.24	0.22	0.25
		B	0.05	0.82	5.0	2.79	3.24	0.12	0.14
		C	0.04	0.69	5.0	2.79	3.24	0.07	0.08
	8		0.18	0.83	5.0	2.79	3.24	0.41	0.48
	9	A	0.05	0.66	5.0	2.79	3.24	0.10	0.11
	10	A	0.03	0.67	5.0	2.79	3.24	0.06	0.07
	Site		1.86	0.82	7.0	2.27	2.47	3.48	3.79

Based on these preliminary results, the proposed project peak flow rate leaving the site is equal to or less than the existing condition peak flow rate. In the proposed condition there is also some storage provided by the proposed biotreatment basins that is not accounted for in the rational method peak flow calculations. Due to these conclusions, no detention basins are proposed for the site to attenuate peak flows.

3.0 HYDRAULICS

In order to meet the guidelines and requirements set forth in the "Santa Clara Valley Urban Runoff Pollution Prevention Program – C.3 Stormwater Handbook," dated April 2012 adopted by the City of Santa Clara, permanent storm water control measures will be incorporated into the project in order to mitigate the impacts of pollutants in storm water runoff from the proposed project. These permanent storm water control measures are discussed in the associated stormwater management plan, titled "Preliminary Stormwater Management Plan for Santana Terrace," dated June 22, 2015, which includes more details regarding the permanent storm water control measures that will be incorporated into the project in order to mitigate the impacts of pollutants in storm water runoff from the proposed project.

3.1 On-Site Drainage

Stormwater from the proposed project buildings and site will flow into the proposed biotreatment basins placed throughout the site. In the smaller more frequent storms, all flows will be treated as they percolate through the basins, then these flows will be drained through perforated underdrains and travel into the proposed storm drain system. In larger storm events where stormwater flows into these basins faster than the water can be treated, there are proposed grate inlets set at the design ponding elevation in the basins.

The inlets will be sized based on the proposed 10-year storm event flow rates using the weir equation. Please see the preliminary inlet sizing calculations in Appendix 5.

Preliminary storm drain sizing was completed by determining the pipe capacity using Manning's equation and a Manning's n-Value of 0.011 for PVC pipe and assuming the pipe is flowing full. Based on preliminary hydraulic calculations it appears that the existing 12" pipe flowing from the project site to the storm drain manhole in North Winchester Boulevard may be under sized due to a nearly flat pipe slope. The final determination of whether to replace the pipe or not will be made at final design. Preliminary storm drain calculations can be found in Appendix 5 The proposed storm drain system will be designed using the Hydraflow Storm Sewers Extension for

AutoCAD Civil3D (v.10.3). All pipes are proposed as PVC SDR 35 with a minimum slope of 0.5%.

The site shall be designed such that overland release from the 100-year event shall be held a minimum of 12” below any adjacent finished floor elevations.

4.0 SUMMARY

This preliminary drainage report provides the findings, calculations, and results for the proposed Santana Terrace project. The project is located at 100 North Winchester Boulevard, in the City of Santa Clara, California. The development consists of two senior apartment buildings consisting of 92 units with approximately 140,000 square feet of gross floor area, a pool and maintenance building, parking, walkways, landscaped areas, as well as a pool and spa, on approximately 1.86 acres. In the pre-project condition the site consists of one three story commercial office building reported to contain approximately 65,000 square feet of floor area, extensive paving areas, and landscaped areas. The existing site employs no permanent stormwater control measures. The existing project site is approximately 89.2 percent impervious and the proposed project results in a slight reduction of impervious area at 89.0 percent impervious.

This report has been prepared in conjunction with a stormwater management plan, titled "Preliminary Stormwater Management Plan for Santana Terrace," dated June 22, 2015, which includes more details regarding the permanent storm water control measures that will be incorporated into the project in order to mitigate the impacts of pollutants in storm water runoff from the proposed project.

The project site is located within FEMA Zone X (shaded) and may be subject to flooding in the 500-year storm event. FEMA regulates flooding up to and including the 100-year storm event, therefore it is not anticipated that any FEMA submissions will be required for this project.

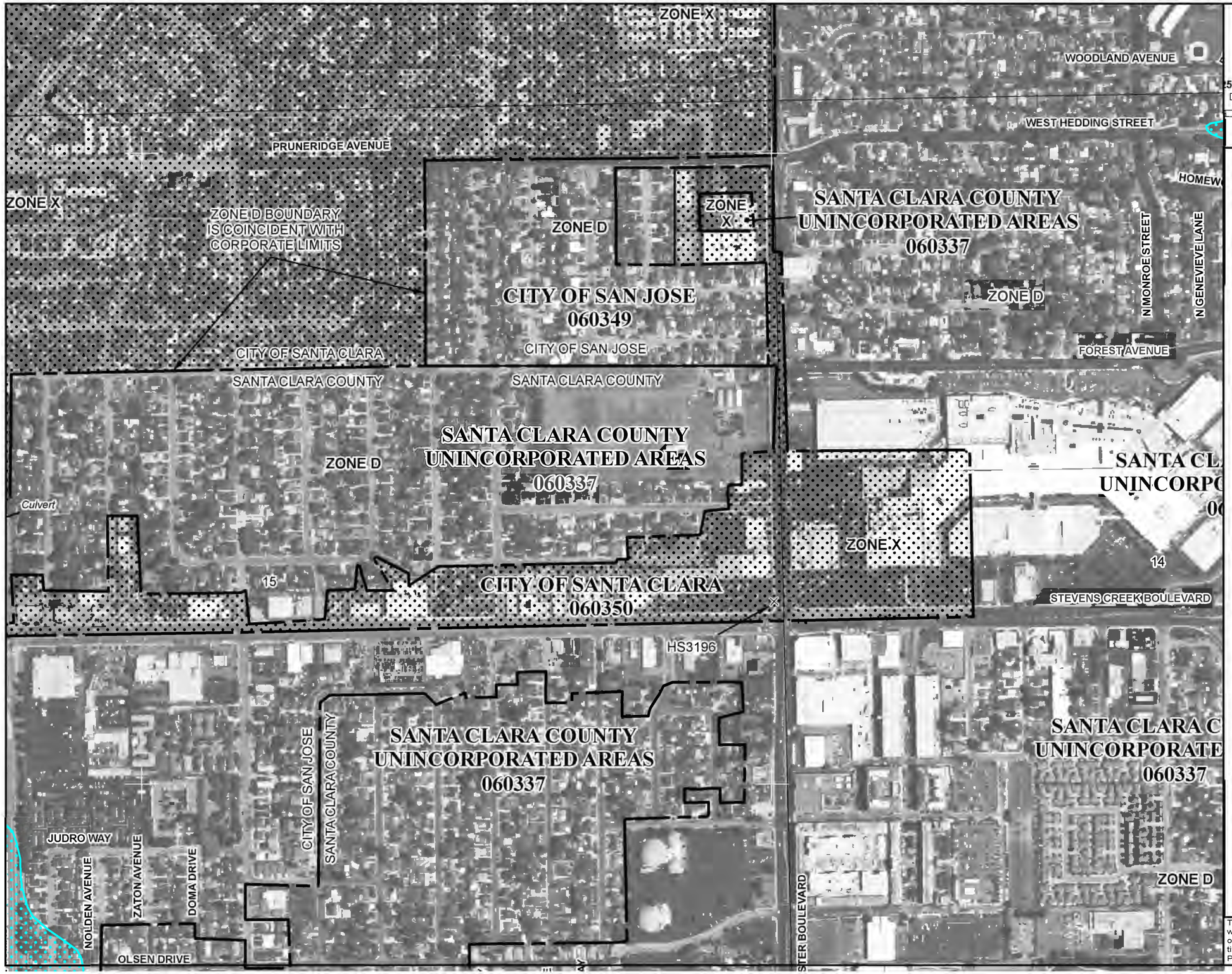
Hydrologic calculations were computed in accordance with the Santa Clara County, California - Drainage Manual, dated 2007 (SCCDM), and the City of Santa Clara – Design Criteria, Section 6, dated September 2014. The Rational Method was used to calculate the discharges for the 10 and 100-year storm events. The hydrologic workmaps for the existing and proposed conditions are in Appendices 3 and 4 respectively. The hydrologic calculations and back up information can be found in Appendix 2. Based on these preliminary results, the proposed project peak flow rate leaving the site is equal to or less than the existing condition peak flow rate. In the proposed

condition there is also some storage provided by the proposed biotreatment basins that is not accounted for in the rational method peak flow calculations. Due to these conclusions, no detention basins are proposed for the site to attenuate peak flows.

The preliminary storm drain system sizing for the proposed site was completed by determining the pipe capacity using Manning's equation and a Manning's n-Value of 0.011 for PVC pipe. Based on the preliminary hydraulic calculations it appears that the existing 12" pipe flowing from the project site to the storm drain manhole in North Winchester Boulevard may be under sized due to a nearly flat pipe slope. The final determination of whether to replace the pipe or not will be made at final design. Preliminary storm drain calculations can be found in Appendix 5 The proposed storm drain system will be designed using the Hydraflow Storm Sewers Extension for AutoCAD Civil3D (v.10.3). All pipes are proposed as PVC SDR 35 with a minimum slope of 0.5%. The proposed inlets will be sized based on the proposed 10-year storm event flow rates using the weir equation. Please see the preliminary inlet sizing calculations in Appendix 5. The site shall be designed such that overland release from the 100-year event shall be held a minimum of 12" below any adjacent finished floor elevations.

APPENDIX 1

FEMA FIRMETTE



MAP SCALE 1" = 500'

250 0 500 1000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0229H

FIRM

FLOOD INSURANCE RATE MAP

SANTA CLARA COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 229 OF 830
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN JOSE, CITY OF	060349	0229	H
SANTA CLARA COUNTY	060337	0229	H
SANTA CLARA, CITY OF	060350	0229	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06085C0229H

EFFECTIVE DATE
MAY 18, 2009

Federal Emergency Management Agency

APPENDIX 2

HYDROLOGIC CALCULATIONS AND BACK-UP DATA

RICK ENGINEERING COMPANY

Preliminary Rational Method Calculations

Job Name: Santana Terrace
Job Number: 17271-B
Date: 6/19/2015

Mean Annual Precipitation (in)	14.9

Land Use Type	Runoff Coefficient
Urban Open Space	0.35
Pavement/Concrete	0.85
Roof	0.90

Design Standards:
Santa Clara County, California - Drainage Manual (2007)

Runoff coefficients per Table 3-1, Type C soils
Initial Time of Concentration "value is assumed to be 10 minutes where a substantial area is drained, and 5 minutes when only street or parking lot sections are drained."
Velocity calculated based on the storm drain pipe assuming the pipe is flowing half full and a Manning's n-Value of 0.013.

Pre- or Post-Project	Major Basin	Sub-Basin(s)	Area (sqft)			Total Area (ac)	Weighted Runoff Coefficient	Time of Concentration								Total Tc (min)	Intensity						Peak Flow Rate (cfs)	
									Additional Tc								10-Year			100-Year				
			Open Space/Parks	Pavement/ Concrete	Roof			Initial Tc (min)	Flow Length (ft)	Elevation Upstream (ft)	Elevation Downstream (ft)	Slope (ft/ft)	Pipe Diameter (in)	Velocity (ft/s)	Additional Tc (min)		$A_{10,D}$	$B_{10,D}$	i_{10} (in/hr)	$A_{100,D}$	$B_{100,D}$	i_{100} (in/hr)	10-Year	100-Year
Pre-Project	Site		8782.5	31965.1	40410.4	1.86	0.82	5.0	89.7	114.61	114.06	0.0061	8	4.31	0.35	6.6	0.2201	0.0025	2.35	0.2845	0.0048	2.59	3.59	3.95
									148.2	114.05	112.93	0.0076	8	4.79	0.52									
									119.8	112.93	112.10	0.0069	8	4.59	0.44									
									104.6	112.07	111.41	0.0063	10	5.08	0.34									
Post-Project	1	A			2194	0.05	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.15
		B			2677	0.06	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.15	0.18
		C	359	2715	98	0.07	0.79	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.16	0.19
		D	192	1619	722	0.06	0.83	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.16
		E	148	1565	1028	0.06	0.84	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.15	0.17
		F	142	1305	900	0.05	0.84	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.15
		G	435	980	386	0.04	0.74	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.09	0.10
	2	A			3464	0.08	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.20	0.23
		B	142	640	339	0.03	0.80	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.06	0.07
		C	138	1296	943	0.05	0.84	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.15
		D	152	1547	1140	0.07	0.84	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.15	0.18
		E	163	1617	622	0.06	0.83	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.15
		F	487	2986	393	0.09	0.79	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.20	0.23
	3	A	644	874	50	0.04	0.65	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.06	0.08
	4	A	520	998	127	0.04	0.70	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.07	0.09
	5	A			2581	0.06	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.15	0.17
		B			1195	0.03	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.07	0.08
		C			1012	0.02	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.06	0.07
		D			1008	0.02	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.06	0.07
		E			630	0.01	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.04	0.04
		F			564	0.01	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.03	0.04
		G	2185		402	0.06	0.44	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.07	0.08
	5		2185		7392	0.22	0.77	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.48	0.55
	6	A			2316	0.05	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.16
		B			1509	0.03	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.09	0.10
		C			1293	0.03	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.07	0.09
		D			2330	0.05	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.16
		E			1509	0.03	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.09	0.10
		F			1115	0.03	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.06	0.07
		G			1254	0.03	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.07	0.08
	6				11326	0.26	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.65	0.76
	7	A			2259	0.05	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.15
		B			2312	0.05	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.13	0.15

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ENGINEERING COMPANY

Preliminary Rational Method Calculations

Job Name: Santana Terrace
Job Number: 17271-B
Date: 6/19/2015

Mean Annual Precipitation (in)	14.9

Land Use Type	Runoff Coefficient
Urban Open Space	0.35
Pavement/Concrete	0.85
Roof	0.90

Design Standards:
Santa Clara County, California - Drainage Manual (2007)

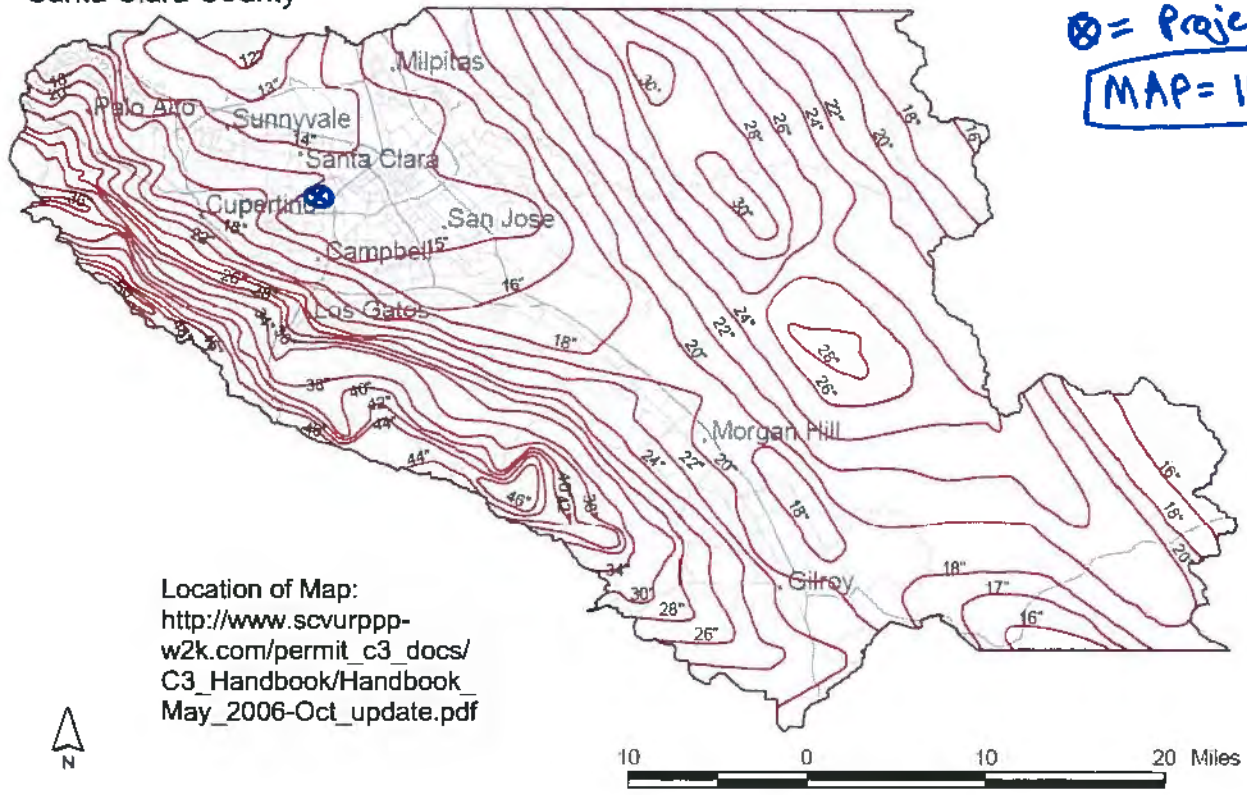
Runoff coefficients per Table 3-1, Type C soils
Initial Time of Concentration "value is assumed to be 10 minutes where a substantial area is drained, and 5 minutes when only street or parking lot sections are drained."
Velocity calculated based on the storm drain pipe assuming the pipe is flowing half full and a Manning's n-Value of 0.013.

Pre- or Post-Project	Major Basin	Sub-Basin(s)	Area (sqft)			Total Area (ac)	Weighted Runoff Coefficient	Time of Concentration									Intensity						Peak Flow Rate (cfs)	
									Additional Tc								10-Year			100-Year				
			Open Space/Parks	Pavement/ Concrete	Roof			Initial Tc (min)	Flow Length (ft)	Elevation Upstream (ft)	Elevation Downstream (ft)	Slope (ft/ft)	Pipe Diameter (in)	Velocity (ft/s)	Additional Tc (min)	Total Tc (min)	$A_{10,D}$	$B_{10,D}$	i_{10} (in/hr)	$A_{100,D}$	$B_{100,D}$	i_{100} (in/hr)	10-Year	100-Year
Post-Project	7	C			2886	0.07	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.17	0.19
		D	103	1832	181	0.05	0.83	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.11	0.13
		E	961	1199	428	0.06	0.67	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.11	0.13
	7		1064	3031	8066	0.28	0.84	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.65	0.76
	8	A			3754	0.09	0.90	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.22	0.25
		B	156	1867	271	0.05	0.82	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.12	0.14
		C	574	681	398	0.04	0.69	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.07	0.08
	8		731	2547	4423	0.18	0.83	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.41	0.48
	9	A	899	1025	378	0.05	0.66	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.10	0.11
	10	A	507	587	221	0.03	0.67	5.0								5.0	0.2019	0.0021	2.79	0.2700	0.0036	3.24	0.06	0.07
	Site	Longest Flow Path: Basin 9A to N.Winchester	8909	25428	46823	1.86	0.82	5.0	47.2	--	--	0.0050	8	3.90	0.20	7.0	0.2246	0.0027	2.27	0.2881	0.0051	2.47	3.48	3.79
									55.4	--	--	0.0050	10	4.52	0.20									
									116.0	--	--	0.0050	12	5.11	0.38									
									226.4	--	--	0.0050	12	5.11	0.74									
									116.8	--	--	0.0050	12	5.11	0.38									
									16.4	--	--	0.0050	12	5.11	0.05									

BACK-UP DATA

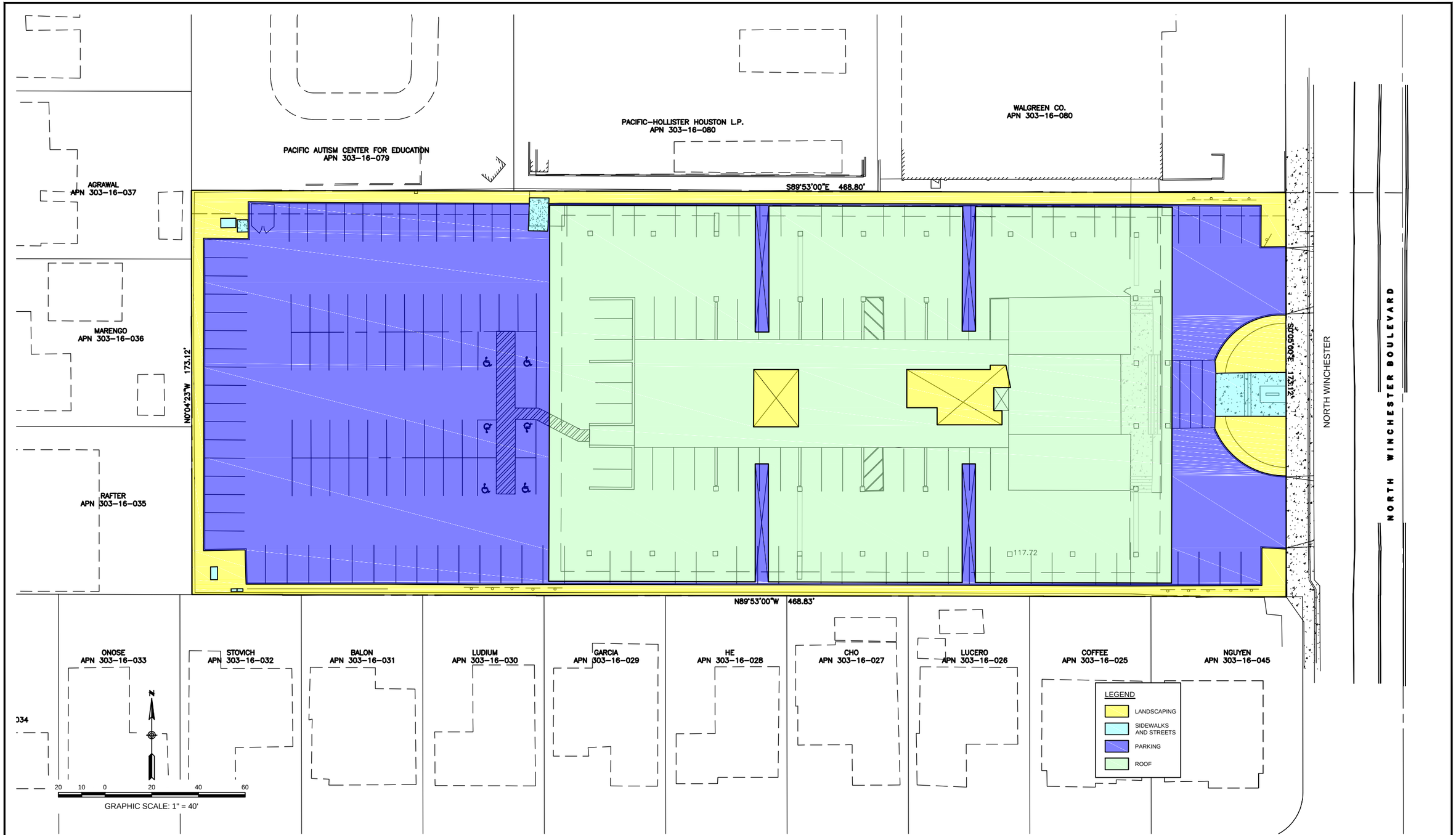
17271-B Santana Terrace SWMP
Mean Annual Precipitation Determination.
6/18/15

Figure A-2
Mean Annual Precipitation Map
Santa Clara County



SOURCE: Santa Clara Valley Water District, Mean Annual Precipitation Map, San Francisco & Monterey Bay Region, 1998

Figure A-2: Mean Annual Precipitation, Santa Clara County



E:\17271 - 100 North Winchester _Santa Clara\17271B-Santana Terrace\WaterResources\17271-B_Workmap_Existing_Pervious-Impervious.dwg
REC DPW COLOR.ctb

RICK ENGINEERING COMPANY
Sacramento
2525 EAST BIDWELL STREET
FOLSOM, CA 95630
916.638.8200
(FAX)916.934.5144
rickengineering.com
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PRELIMINARY EXISTING CONDITION LAND USE FOR THE SANTANA TERRACE PROJECT

J-17271-B
DATE: JUNE 19, 2015

SHEET 1 OF 1

PACIFIC AUTISM CENTER FOR EDUCATION
APN 303-16-079

PACIFIC-HOLLISTER HOUSTON L.P.
APN 303-16-080

WALGREEN CO.
APN 303-16-080

AGRAWAL
APN 303-16-037

MARENGO
APN 303-16-036

RAFTER
APN 303-16-035

S89°53'00"E 468.80'

N0°04'23"W 173.12'

N89°53'00"W 468.83'

NORTH WINCHESTER

ONOSE
APN 303-16-033

STOVICH
APN 303-16-032

BALON
APN 303-16-031

LUDIUM
APN 303-16-030

GARCIA
APN 303-16-029

HE
APN 303-16-028

CHO
APN 303-16-027

LUCERO
APN 303-16-026

COFFEE
APN 303-16-025

NGUYEN
APN 303-16-045

034

N

20 10 0 20 40 60

GRAPHIC SCALE: 1" = 40'

LEGEND

- LANDSCAPING
- SIDEWALKS AND STREETS
- PARKING
- ROOF

PRELIMINARY PROPOSED CONDITION LAND USE FOR THE SANTANA TERRACE PROJECT

RICK ENGINEERING COMPANY
Sacramento

2525 EAST BIDWELL STREET
FOLSOM, CA 95630
916.638.8200
(FAX)916.934.5144

rickengineering.com
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E:\17271 - 100 North Winchester _Santa Clara\17271B-Santana Terrace\WaterResources\17271-B_Workmap_Proposed_Pervious-Impervious.dwg
REC DPW COLOR.ctb

APPENDIX 3

EXISTING CONDITION HYDROLOGY WORKMAP

PRELIMINARY EXISTING CONDITION HYDROLOGY FOR THE SANTANA TERRACE PROJECT

SHEET 1 OF 1

J-17271-B
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RICK ENGINEERING COMPANY
Sacramento
2525 EAST BIDWELL STREET
FOLSOM, CA 95630
916.638.8200
(FAX)916.934.5144
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E:\17271 - 100 North Winchester _Santa Clara\17271B-Santana Terrace...
DPW Full Size.ctb

APPENDIX 4

PROPOSED CONDITION HYDROLOGY WORKMAP

PRELIMINARY PROPOSED CONDITION HYDROLOGY
FOR THE
SANTANA TERRACE PROJECT

RICK
ENGINEERING COMPANY
Sacramento
2525 EAST BIDWELL STREET
FOLSOM, CA 95630
916.638.8200
(FAX)916.934.5144
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J-17271-B
DATE: JUNE 19, 2015

SHEET 1 OF 1

APPENDIX 5

HYDRAULIC CALCULATIONS

RICK ENGINEERING COMPANY

Inlet Capacity Calculations

Job Name: Santana Terrace
Job Number: 17271-B
Date: 6/21/2015

Weir Equation:

$$Q = C*L*H^{1.5}$$

Weir Coefficient	2.6	Headwater (in)	2

Inlet Size	Weir Length (ft)	Q (cfs)
12"x12" Grate Inlet	4	0.71
24"x24" Grate Inlet	8	1.42
36"x36" Grate Inlet	12	2.12

RICK ENGINEERING COMPANY

Preliminary Pipe Sizing Calculations

Job Name: Santana Terrace
Job Number: 17271-B
Date: 6/21/2015

Manning's Equation:

$$Q = A \times (1.49 / n) \times (A / Pw)^{(2/3)} \times (S)^{(1/2)}$$

Calculation Assumes Pipe is Flowing Full

Manning's n [n]	0.011	Pipe Slope [S] (ft/ft)	0.005

Pipe Diameter (in)	Area [A] (ft^2)	Wetted Perimeter [Pw] (ft)	Flow [Q] (cfs)
6	0.20	1.57	0.47
8	0.35	2.09	1.01
10	0.55	2.62	1.84
12	0.79	3.14	2.99
15	1.23	3.93	5.41
18	1.77	4.71	8.80